

What is claimed is:

1. A sheet feeding device comprising:

a sheet tray on which sheets are stacked;

an elastic support member that lifts up and supports, with the elastic force of an elastic member, the stack of sheets stacked on the sheet tray;

a sheet feeding unit that successively feeds, beginning with the uppermost sheet, the stack of sheets lifted up by the elastic support member;

a following movable member which is disposed so as to contact the uppermost sheet of the stack of sheets stacked on the sheet tray and which follows and moves in accordance with the change in the stacking amount of the sheets;

a restraining mechanism that restrains the elastic support member in accordance with the stacking amount of the sheets so that the position of the uppermost sheet of the stack of sheets stacked on the sheet tray is held at a substantial constant, the restraining mechanism including an engagement member that moves together with the elastic support member and a restraining member that restrains the movement of the engagement member; and

a release mechanism that interlocks with the movement of the following movable member to release the restrained state resulting from the restraining mechanism;

wherein the restraining member moves along a straight locus

at least in the vicinity of an engaging portion between the engagement member and the restraining member so as to engage with and disengage from the engagement member.

2. The sheet feeding device according to claim 1, wherein the following movable member comprises a sheet feeding member that configures part of the sheet feeding unit and is disposed so as to contact the uppermost sheet of the stack of sheets stacked on the sheet tray.

3. The sheet feeding device according to claim 1, wherein the following movable member comprises a rotating body that is rotatable.

4. The sheet feeding device according to claim 1, wherein the engagement member comprises a gear in which teeth are formed at least on part of a peripheral surface thereof; and

the restraining member comprises a rack on which at least one tooth that meshes with the gear is formed.

5. The sheet feeding device according to claim 1, wherein the restraining member comprises driven portions at at least two places and simultaneously drives both driven portions when moving.

6. The sheet feeding device according to claim 5, further comprising an urging member disposed at the restraining member;

wherein the urging member urges a substantially intermediate portion between the driven portions disposed at the two places on the restraining member.

7. The sheet feeding device according to claim 4, wherein the teeth of the gear and the rack are involute teeth, with the pressure angle thereof being 8 to 12 degrees.
8. The sheet feeding device according to claim 1, wherein the release mechanism comprises:
- a release operational member that moves together with the following movable member;
  - a contact interlocking member that abuts against and interlocks with the release operational member; and
  - a coupling member that is disposed between the contact interlocking member and the restraining mechanism and releasably couples the restraining mechanism.
9. The sheet feeding device according to claim 8, wherein the coupling member comprises a gear train that meshes with the driven portions of the restraining mechanism, with the contact interlocking member being coupled to one of the gears of the gear train.
10. The sheet feeding device according to claim 9, wherein in the gear train, the number of teeth of each gear is set so that the rotational force of the gear coupled to the contact interlocking member is amplified and transmitted to the driven portions of the restraining mechanism.
11. The sheet feeding device according to claim 1, further comprising a guide mechanism by which the locus of movement of the elastic support member is guided.

12. The sheet feeding device according to claim 11, wherein the restraining mechanism comprises the engagement member disposed at the elastic support member and having a gear that moves together with the elastic support member, and the restraining member having a rack that restrains the movement of the engagement member;

the guide mechanism comprises a guide gear that is disposed separately from the gear of the restraining mechanism at the elastic support member, and a guide rack that meshes with the guide gear and guides the locus of movement of the elastic support member; and

the module of the gear that is the engagement member of the restraining mechanism is set to be smaller than that of the guide gear.

13. The sheet feeding device according to claim 1, wherein the engagement member is attached to the elastic support member via a one-way clutch.

14. The sheet feeding device according to claim 1, further comprising a buffer member in which a buffering force is imparted to the movement of the elastic support member;

wherein the buffer member is attached to the elastic support member via a one-way clutch.

15. The sheet feeding device according to claim 13, wherein coupling of the one-way clutch is cut when the elastic support member is lowered.

16. The sheet feeding device according to claim 14, wherein coupling of the one-way clutch is cut when the elastic support member is lowered.

17. The sheet feeding device according to claim 1, wherein the sheet feeding unit comprises a sheet feeding member and a separating mechanism that separates, one sheet at a time, the sheets fed by the sheet feeding member.

18. The sheet feeding device according to claim 1, further comprising a return mechanism that returns the elastic support member lifted up by the elastic support member to a return position that is a lift-up initial position of the stack of sheets.

19. The sheet feeding device according to claim 18, wherein the return mechanism comprises a return-use engagement member at the elastic support member and a pushdown mechanism by which the return-use engagement member is forcibly pushed down.

20. The sheet feeding device according to claim 18, further comprising a sheet tray that can be pulled out from an apparatus body;

wherein the return mechanism interlocks with the pullout operation of the sheet tray to return the elastic support member to the return position.

21. The sheet feeding device according to claim 19, further comprising a sheet tray that can be pulled out from an apparatus body;

wherein the pushdown mechanism comprises a cam that is

disposed at the apparatus body, interlocks with the pullout operation of the sheet tray, engages with the return-use engagement member and forcibly pushes down the return-use engagement member.

22. The sheet feeding device according to claim 18, further comprising a return position fixing mechanism that releasably fixes the elastic support member at the return position.

23. The sheet feeding device according to claim 22, wherein the return position fixing mechanism comprises:

- a return engagement member that is disposed at the elastic support member and moves together with the elastic support member;

- a return restraining member that restrains the movement of the return engagement member with the condition that the elastic support member has reached the return position; and

- a return release member that releases the restrained state resulting from the return restraining member.

24. The sheet feeding device according to claim 23, wherein the return engagement member comprises a gear where teeth are formed at least on part of a peripheral surface thereof; and

- the return restraining member comprises a rack on which at least one tooth that meshes with the gear is formed.

25. The sheet feeding device according to claim 24, wherein the return restraining member moves along a straight locus at least in the vicinity of an engaging portion between the restraining member and the return engagement member so as to

engage with and disengage from the return engagement member.

26. The sheet feeding device according to claim 24, wherein the teeth of the rack that is the return restraining member and the gear that is the return engagement member are saw teeth.

27. The sheet feeding device according to claim 23, wherein the return release member acts on the return restraining member in a state where preparations for feeding the sheets have been completed.

28. The sheet feeding device according to claim 21, further comprising a sheet tray that can be pulled out from an apparatus body;

wherein the return release member comprises a protruding member that is disposed at the apparatus body and releases the restrained state of the return restraining member in a state where the sheet tray has been loaded in the apparatus body.

29. The sheet feeding device according to claim 18, further comprising a guide mechanism by which the locus of movement of the elastic support member is guided.

30. The sheet feeding device according to claim 29, wherein the restraining mechanism comprises an engagement member having a gear that moves together with the elastic support member, and the restraining member having a rack that restrains the movement of the engagement member;

the guide mechanism comprises a guide gear that is disposed, separately from the gear of the restraining mechanism, at the

elastic support member and a guide rack that meshes with the guide gear and guides the locus of movement of the elastic support member; and

the module of the gear that is the engagement member of the restraining mechanism is set to be smaller than that of the guide gear.

31. A sheet processing apparatus comprising:

a sheet processing section; and ✓

a sheet feeding device including:

a sheet tray on which sheets are stacked;

an elastic support member that lifts up and supports, with the elastic force of an elastic member, the stack of sheets stacked on the sheet tray;

a sheet feeding unit that successively feeds, beginning with the uppermost sheet, the stack of sheets lifted up by the elastic support member;

a following movable member disposed so as to contact the uppermost sheet of the stack of sheets stacked on the sheet tray and which follows and moves in accordance with the change in the stacking amount of the sheets;

a restraining mechanism that restrains the elastic support member in accordance with the stacking amount of the sheets so that the position of the uppermost sheet of the stack of sheets stacked on the sheet tray is held at a substantial constant, the restraining mechanism including an engagement member that



moves together with the elastic support member and a restraining member that restrains the movement of the engagement member; and

a release mechanism that interlocks with the movement of the following movable member to release the restrained state resulting from the restraining mechanism;

wherein the restraining member moves along a straight locus at least in the vicinity of an engaging portion between the engagement member and the restraining member so as to engage with and disengage from the engagement member.